

REMARKS/ARGUMENTS

The Office Action dated July 15, 2009 and the references cited therein have been carefully considered. In response to the Office Action, Applicants have amended Claims 1-5, 9-13 and 15-16 and canceled Claims 17-24, which, when considered with the remarks set forth below, are deemed to place the case with Claims 1-16 in condition for allowance.

Claim Rejections - 35 USC §112

Claims 1-16 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite. In response, Applicants have amended independent Claim 1 so that each process step is positively recited, as recommended by the Examiner. Applicants have further amended the claims to address each rejection under §112 set forth in the Office Action. As a result, it is believed that the rejections to the claims under 35 U.S.C. §112 have been overcome.

Claim Rejections - 35 USC §§102 and 103

Claims 1-4, 6-9 and 11-16 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,715,623 to Roule et al. and Claims 14-16 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the Roule et al. patent. Claims 5 and 10 have not been rejected based on prior art. In this regard, the Examiner states that prior art could not be applied to Claims 5 or 10 because the Examiner could not determine the scope of the claims based on their indefiniteness.

In response, Applicants have amended independent Claim 1 to include the limitations of dependent Claim 16. Specifically, Claim 1 has been amended to further define a microscopic surface structure defined by a plurality of replicated grooves having a spatial frequency of more than 50 grooves/mm and a profile depth of less than 2 µm. It is respectfully submitted that the cited Roule patent fails to teach or suggest a process for producing a high-resolution printed surface pattern, wherein a substrate is formed with a microscopic surface structure having the recited structural features of amended Claim 1.

1. The Roule patent does not teach or suggest a process for producing a high-resolution printed surface pattern on a substrate, as defined in Claim 1.

The Roule patent discloses a method for impressing a secret pattern on a security document by creating a spatial pattern on the surface of the security document by means of intaglio printing, without the application of a printing substance or printing ink. This results in a pattern of ridges and grooves formed in a foreground area, which are distinctively different from the ridges and grooves in a background area. These different patterns are only visible under a certain viewing angle due to a contrast in reflectivity. (See column 1, lines 43-66.)

More specifically, as shown in Figures 1-3 of the Roule patent, grooves are impressed into the surface of a sheet of paper (1), whereas the grooves (1a) within one pattern area (letters X, Z) have a first orientation and, in the surrounding area, the grooves (1b) are oriented perpendicular to the first grooves (1a). (See column 3, lines 32-56.) If the surface of the sheet of paper is viewed from a small angle to the paper surface, as shown in Figure 5, a difference in the reflection in the pattern area and in the background area can be seen so that, for a first orientation, the pattern area (letters X, Z) seems lighter (Figure 6) and for an orientation perpendicular to the pattern area, the pattern area seems darker than the background (Figure 7). (See column 3, line 59 to column 4, line 3.)

This effect is created by the angle of incidence being equal to the angle of reflection, as shown for the viewing situation according to Figure 5. In this situation, the grooves oriented perpendicular to the direction of view will reflect light incident light from the flank of the grooves, which are tilted in relation to the paper surface so that the light is reflected back with a respective smaller emergent angle due to the decrease of the angle of incidence. This light does not reach the eye and, therefore, the area defined by the perpendicular grooves appears darker. (See also column 5, lines 8 to 29 and Figure 21.)

Thus, the invention described in the Roule patent is completely different than that defined in Claim 1. In particular, the aim of the process described in the Roule patent is to create a pattern on a document which is only visible under a certain viewing angle. In stark contrast, the present invention provides a process for improving the resolution of a printed image created by an ink application printing process. More specifically, Claim 1 defines a

process for applying a printing substance to a micro-structured substrate to create a printed pattern with a high resolution, which is particularly higher than the resolution of the printing method which is used for creating the printing image.

In the present invention defined by Claim 1, a microscopic surface structure is formed in the surface of a substrate and an amount of a printing substance is applied over the microscopic surface structure. The microscopic surface structure affects the flow of the printing substance so that the line width of the printed image can be adjusted as desired.

There is absolutely no mention or suggestion in the Roule patent of utilizing a microscopic surface structure to influence the resolution of a printed image. Instead, the groove pattern disclosed in the Roule patent is only utilized to reflect light to generate an optical effect, as described above. The Roule patent does not teach or suggest a process for creating a printed image, wherein the line width of the printed image is influenced or can be influenced by this groove pattern.

While the Roule patent discloses a step where the hidden pattern can also be partially printed over with printing ink, this step is only undertaken in order to optically distract the observer from the pattern and, therefore, conceal the pattern more effectively. (See column 2, lines 7 to 13.) For example, Figures 16 and 17 of the Roule patent show a printing image (32) applied to the areas with the groove pattern as well as to the areas without the groove pattern. However, nowhere in the Roule patent is it mentioned that the groove pattern determines the line width of the printing image which is applied to the surface. Rather, it is clear from Figure 17 that the groove pattern does not have any influence on the line width of the printing image. (Note that the printed letter "G" in Figure 17 is not affected in any manner by the underlying grooves formed in the substrate.)

Thus, the Roule patent does not teach or suggest a process for producing a high-resolution printed surface pattern on a substrate involving the steps of forming a microscopic surface structure on the substrate and subsequently applying an amount of a printing substance to the substrate, wherein the line width of the resulting printed image is dependent on the orientation direction and profile shape of the grooves of the microscopic surface structure, as defined in Claim 1. Accordingly, it is respectfully submitted that amended Claim 1, and the claims dependent therefrom, patentably distinguish over the prior art.

2. The Roule patent fails to teach or suggest a microscopic surface structure being defined by a plurality of grooves replicated in a surface of a substrate, wherein the grooves have a spatial frequency of more than 50 grooves/mm and a profile depth of less than 2 µm, as defined in amended Claim 1.

As mentioned above, Applicants have amended Claim 1 to include the microscopic surface structure dimensional limitations from dependent Claim 16. It is respectfully submitted that the Roule patent fails to teach or suggest these dimensional limitations.

In rejecting original dependent Claim 16, the Examiner concedes that the Roule patent fails to teach a microscopic surface structure having a spatial frequency of more than 50 grooves/mm and a profile depth of less than 2 µm. However, the Examiner states that it would have been obvious to set the spatial frequency to more than 50 grooves/mm and the profile depth to less than 2 µm to optimize the resultant pattern on the substrate. Applicants respectfully disagree.

It is first important to note that Claim 1 defines a microscopic surface structure in the substrate. The term “microscopic” means that the surface structure is only visible through a microscope, and is not visible with the naked eye. This is the basic distinction with the groove pattern disclosed in the Roule patent, wherein it is necessary that the grooved structure disclosed in the Roule patent can be seen at certain viewing angles by the naked eye. Therefore, the grooved structure disclosed in the Roule patent is not a microscopic structure, as defined in Claim 1.

Secondly, the microscopic surface structure recited in amended Claim 1 is defined by a plurality of grooves replicated in the surface of the substrate, wherein the grooves have a spatial frequency of more than 50 grooves/mm and a profile depth of less than 2 µm. The spatial frequency of the groove pattern disclosed in the Roule patent is stated as 120 lines per inch (equivalent to about 5 grooves/mm) and the depth of the grooves disclosed in the Roule patent is stated as 0.0025” (equivalent to about 64 µm). (See column 5, lines 38 to 44.) This difference between the spatial frequency and depth of the groove pattern disclosed in the Roule patent and the microscopic surface structure defined in Claim 1, (i.e., 50 grooves/mm compared to 5 grooves/mm and 2 µm compared to 64 µm) is of an order of magnitude that is quite significant. Clearly, since these values differ by more than ten times, it cannot be

concluded that it would have been obvious to modify the teachings of Roule to bridge this significant differential.

Instead, the Roule patent clearly teaches away from making such modification. Specifically, one having ordinary skill in the art would certainly not use a microscopic surface structure in the substrate disclosed in the Roule patent, since it is essential that the flanks of the grooved structure disclosed in the Roule patent be seen at a certain viewing angle by the naked eye. Substituting a microscopic surface structure as defined in amended Claim 1 for the grooved structure disclosed in the Roule patent would result in a security document unfit for its intended use.

It is further submitted that such modification of the teachings of the Roule patent would be physically impossible. In particular, the highest resolution achieved by the intaglio printing process disclosed in the Roule patent is about 10 to 20 grooves/mm. This is significantly less than the spatial frequencies of the present invention. Indeed, the microscopic structures associated with the present invention cannot be created by means of intaglio printing, which is an essential part of the teaching of the Roule patent. For this additional reason, the teaching of the Roule patent leads one away from the subject-matter of the present invention.

Therefore, it would not have been obvious from the teaching of the Roule patent to form a microscopic surface structure defined by a plurality of grooves replicated in a surface of a substrate, wherein the grooves have a spatial frequency of more than 50 grooves/mm and a profile depth of less than 2 μm , as defined in amended Claim 1. Accordingly, for this additional reason, it is respectfully submitted that amended Claim 1, and the claims dependent therefrom, patentably distinguish over the prior art.

Conclusion

In view of the foregoing amendment and remarks, favorable consideration and allowance of the application with Claims 1-16 are respectfully solicited. If the Examiner believes that a telephone interview would assist in moving the application toward allowance, he is respectfully invited to contact the Applicants' attorney at the telephone number listed below.

Respectfully submitted,

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